Simulation of a Gravity Drained Tank

File: `Ch02_GravityTank.m`

This example demonstrates the key steps in simulating the behavior of a gravity drained tank. The liquid height in the tank is described by a simple differential equation

$$A\frac{dh}{dt} = Q_{in} - Q_{out}$$

where Q_{out} is a function of liquid height known as Torricelli's law

$$Q_{out} = C_v\sqrt{h}$$

Contents

Step 1. Define parameters

Provide values for all relevant parameters. Use comments to describe the parameters and units.

```
Cv  = 120;    % Outlet valve constant [liters/min/meter^1/2]
Qin = 100;    % Inlet flowrate [liters/min]
A   = 1.5;    % Tank area [meter^2]
```

Step 2. Define any functional relationships

```
Qout = @(h) Cv*sqrt(h);
```

Step 3. Write function to evaluate RHS of the differential equations

```
hdot = @(t,h) (Qin - Qout(h))/A/1000;
```

Step 4. Solve for given initial conditions and time span

```
h0 = 0;
tstop = 100;

soln = ode45(hdot,[0 tstop],h0)
```

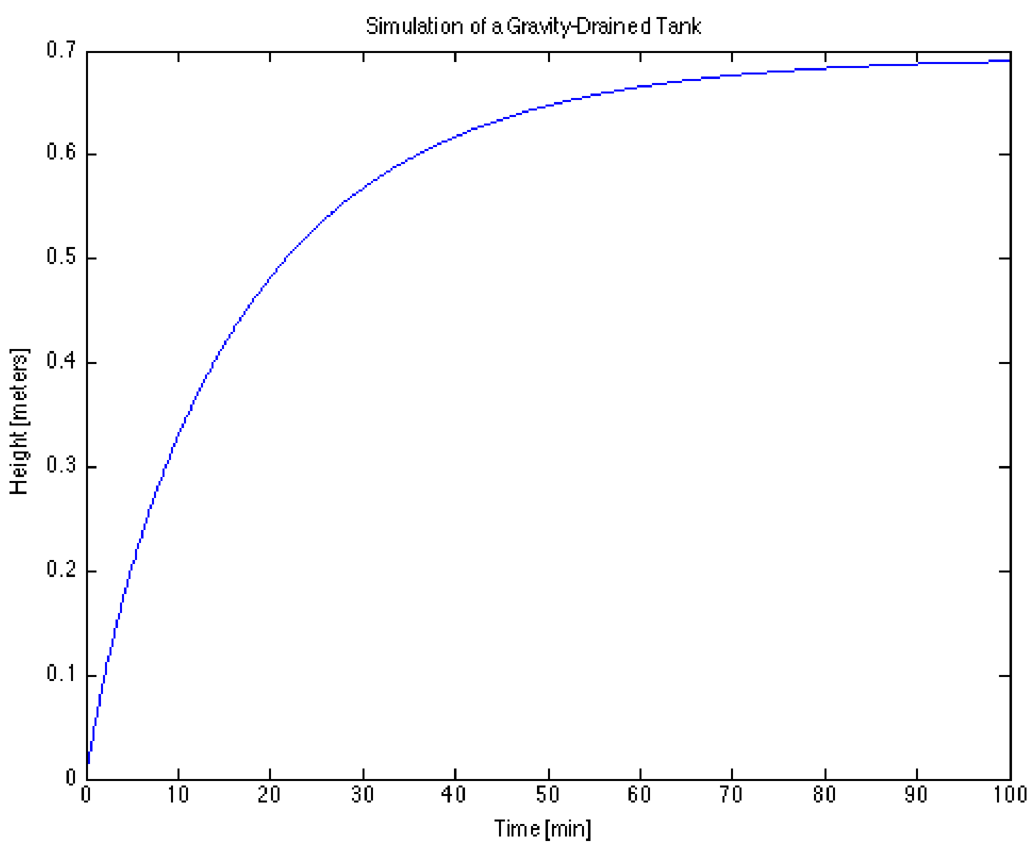
```
soln =
```

```
     solver: 'ode45'
    extdata: [1x1 struct]
          x: [1x18 double]
          y: [1x18 double]
      stats: [1x1 struct]
      idata: [1x1 struct]
```

Step 5. Evaluate and display the solution

```
t = 0:0.1:tstop;
h = deval(soln,t);

plot(t,h);
xlabel('Time [min]');
ylabel('Height [meters]');
title('Simulation of a Gravity-Drained Tank');
```



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